

Noise

Module: `deeprai.tools.noise`

This module provides a set of classes for introducing different types of noise into numpy arrays, typically used for image data augmentation or robustness testing.

1. GaussianNoise Class

Description:

The `GaussianNoise` class applies Gaussian noise to a list of numpy arrays (images).

Attributes:

- **mean** (`float`, default=0): Mean of the Gaussian distribution.
- **std** (`float`, default=1): Standard deviation of the Gaussian distribution.

Methods:

- **compute()**: Internal method to get a function that introduces Gaussian noise to an image.
- **noise(arrays)**: Applies Gaussian noise to a list of numpy arrays. Uses multi-threading for efficiency.

Usage:

```
from deeprai.tools.noise import GaussianNoise

gaussian_noise = GaussianNoise(mean=0, std=25)
noisy_images = gaussian_noise.noise(list_of_images)
```

2. SaltPepperNoise Class

Description:

The `SaltPepperNoise` class introduces salt and pepper noise to a list of numpy arrays.

Attributes:

- **s_vs_p** (`float`, default=0.5): Proportion of salt vs. pepper noise.
- **amount** (`float`, default=0.04): Overall amount of noise to introduce.

Methods:

- **compute()**: Internal method to get a function that introduces salt and pepper noise to an image.
- **noise(arrays)**: Applies salt and pepper noise to a list of numpy arrays. Uses multi-threading for efficiency.

Usage:

```
from deeprai.tools.noise import SaltPepperNoise

sp_noise = SaltPepperNoise(s_vs_p=0.5, amount=0.04)
noisy_images = sp_noise.noise(list_of_images)
```

3. SpeckleNoise Class

Description:

The `SpeckleNoise` class introduces speckle noise to a list of numpy arrays.

Methods:

- **compute()**: Internal method to get a function that introduces speckle noise to an image.
- **noise(arrays)**: Applies speckle noise to a list of numpy arrays. Uses multi-threading for efficiency.

Usage:

```
from deeprai.tools.noise import SpeckleNoise

speckle_noise = SpeckleNoise()
noisy_images = speckle_noise.noise(list_of_images)
```

General Note:

For all the above classes, the `noise` method is designed for efficient computation by applying noise to multiple images using multi-threading. Each image in the input list is processed in a separate thread.

The results are then compiled and returned as a list of numpy arrays.

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